the current amendment. The attached page is captioned "Version with markings to show changes made."

**Objection to the Specification**

The specification was objected to because on page 13, line 6, the term "telemetry unit 38" was not clear to understand because reference number 38 is defined as alarm and there are two different terms of telemetry being defined. The Applicants have amended the specification and Figure 7 to address the objection. Further, the Applicants note that telemetry 46 as disclosed on page 13, line 6 is an example of providing a communications link between the programmer 10 with the computer 34. The IPG telemetry system 14 and programmer telemetry system 16 provide a communications link between the IPG 4 and the programmer 10. In view of the amendments and the foregoing remarks, the Applicants respectfully request withdrawal of this objection to the specification.

**Objection to the Claims**

Claims 28 and 30-34 are objected to for having certain informalities. The Applicants have amended the claims in accordance with the Examiner's suggestions. The Applicants respectfully request withdrawal of the objections.

**Objection to the Drawings**

The drawings are objected to for having certain informalities. The Applicants have amended the drawings and specification in accordance with the Examiner's suggestions. The Applicants respectfully request withdrawal of the objections.

**Rejection Under 35 U.S.C. § 102(b)**

Claims 1-16, 18, 19, 21-24, 29, 30-34, and 35 stand rejected under 35 U.S.C. § 102(b) as being unpatentable over U.S. Patent No. 5,344,431 ("Merritt"). The Applicants traverse the rejection in view of the above amendments and the following Remarks.

Merritt discloses a method and apparatus for determination of battery end-of-service in a medical device. (Abstract). Upon receipt of the battery voltage and battery uplink data, the

programmer may report expected time to end of service by comparing the battery voltage to the voltage value shown in Fig. 2. A percentage capacity remaining is determined and with the uplinked battery current data value, the time to recommended replacement (Time RR) may be calculated. (col. 9, lines 50-57). Battery current may be determined by any number of techniques, for example, by sampling voltage across a small resistor connected between the battery and pacemaker circuit. (col. 9, lines 44-49).

The present invention, on the other hand, discloses a method and apparatus that more accurately estimates the remaining life of the battery. In particular, the present invention discloses at least two methods by which the remaining life is estimated. In one embodiment, the remaining capacity is multiplied by the ratio of used capacity to time the IPG has been working. In another embodiment, the remaining capacity is multiplied by the ratio of used capacity since the IPG was last reprogrammed to the time the IGP has been working since the IPG was last reprogrammed. Merritt, on the other hand, obtains battery current data to calculate remaining time to battery replacement. This instantaneous current information may not take into account the battery usage by the user over an extended period of time. For example, in the event that the current data happens to have been taken during low usage, the formula of Merritt may calculate that the battery much later than it actually does. The present invention, in contrast, takes into account historical power usage information by the user and determines and average usage rate to extrapolate when the battery will become depleted. This allows for a more accurate determination of power source life than that disclosed in Merritt.

For example, with respect to independent claim 1, Merritt fails to disclose, teach, or suggest as least the steps of "obtaining a used capacity of the power source and a time that the power source has been operating; and determining the remaining life of the power source based on the used capacity of the power source and the time that the power source has been operating." Each of the other independent claims recite similar limitations. The dependent claims, which depend from and further limit the amended independent claims, are patentably distinct over Merritt for at least the same

reasons. The Applicants therefore respectfully request withdrawal of this ground for rejection of claims 1-16, 18, 19, 21-24, 29, 30-34, and 35.

**Rejection Under 35 U.S.C. § 103(a)**

Claims 25-28 and 36-39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Merritt in view of various references. In view of the foregoing Amendments and Remarks, the Applicants respectfully submit that these claims are patentably distinct for at least the same reasons. The Applicants therefore respectfully request withdrawal of this ground for rejection of claims 25-28 and 36-39.

**CONCLUSION**

All rejections having been addressed, applicants respectfully submit that the instant application is in condition for allowance, and respectfully solicit prompt notification of the same. Should the Examiner have any questions, the Examiner is invited to contact the undersigned at the number set forth below.

Respectfully submitted,

**Banner & Witcoff, Ltd.**

Dated: April 2, 2002

By: _____

Binal J. Patel
Reg. No. 42,064
Tel: (312) 715-1000

Banner & Witcoff, Ltd.
10 South Wacker Drive, Suite 3000
Chicago, IL 60606

**"Version With Markings To Show Changes Made"**

**IN THE SPECIFICATION**

The first paragraph at page 13 has been amended as follows:

Processor 28 correlates the battery voltage information received from IPG 4 to the battery capacity values in the "look-up" table stored in memory 30. This battery capacity information, whether used battery capacity or remaining battery capacity, may be displayed to the physician through a display screen 32 on the programmer 18 or may be passed from the programmer to an external computer 34 by direct connection 36 or through telemetry ~~38~~ 46 as is well understood in the art. Computer 34 can display the battery capacity information on its display screen ~~36~~ 56, record the information or further process the information.

**IN THE CLAIMS**

Claims 1, 5, 6, 17, 20, 22, 28, 29 and 30 have been amended as follows:

1. (**Amended**) A method of determining the current status and remaining life of a power source in an implantable neurological tissue stimulator comprising the steps of:

assessing the power source voltage of the power source in an implantable neurological tissue stimulator;

determining, based on the assessed power source voltage, where the power source is in its power source life cycle;

obtaining a used capacity of the power source and a time that the power source has been operating; and

determining the remaining life of the power source based on the used capacity of the power source and the time that the power source has been operating. ~~and~~

~~taking appropriate action in response to the determination of where the power source is in its~~

~~power source life cycle.~~

5. (**Amended**) The method of claim ~~4~~ 1 wherein the step of determining the remaining life ~~time~~ of the power source includes the steps of :

determining the probable usage rate of the power source; and

dividing the determined remaining capacity by the probable usage rate of the power source.

6. (**Amended**) The method of claim ~~4~~ 1 wherein the step of determining the remaining life of the power source includes the step of determining the probable usage rate of the power source.

17. (**Amended**) ~~The method of claim 16 wherein the step of calculating the remaining power source capacity by a formula includes the step of~~ A method of determining the current status and remaining life of a power source in an implantable neurological tissue stimulator comprising the steps of:

assessing the power source voltage of the power source in an implantable neurological tissue stimulator;

determining, based on the assessed power source voltage, where the power source is in its power source life cycle by calculating the remaining power source capacity by using a formula of the form: Remaining Battery Capacity = a constant + a constant multiplied by the power source voltage determined in the step of assessing the power source voltage of the power source in an implantable neurological tissue stimulator; and

taking appropriate action in response to the determination of where the power source is in its power source life cycle.

20. (**Amended**) ~~The method of claim 19 wherein the step of calculating the remaining power~~

~~source capacity by a formula includes the step of~~ A method of determining the current status and remaining life of a power source in an implantable neurological tissue stimulator comprising the steps of:

assessing the power source voltage of the power source in an implantable neurological tissue stimulator;

determining, based on the assessed power source voltage, where the power source is in its power source life cycle by calculating the power source capacity used by using a formula of the form: power source capacity used = a constant + a constant multiplied by the power source voltage determined in the step of assessing the power source voltage of the power source in an implantable neurological tissue stimulator; and

taking appropriate action in response to the determination of where the power source is in its power source life cycle.

22. (**Amended**) The method of claim 1 further comprising ~~wherein the step of taking appropriate action in response to the determination of where the power source is in its power source life cycle includes~~ the step of informing the user of where in the power source life the power source is.

28. (**Amended**) The method of claim 27 wherein the step alerting the user by triggering an alarm includes the step of triggering ~~a~~ an alarm chosen from the group consisting of audible or visual warnings.

29. (**Amended**) A method of determining the current status and remaining life of a power source in an implantable neurological tissue stimulator comprising the steps of:

assessing the voltage of the power source in an implantable neurological tissue stimulator;

determining, based on the assessed voltage of the power source, where the power source is in

its life cycle;

obtaining a used capacity of the power source and a time that the power source has been operating; and

determining the remaining life of the power source based on the used capacity of the power source and the time that the power source has been operating. ~~and,~~

~~taking appropriate action in response to the determination of where the power source is in its life cycle.~~

30. (**Amended**) A device for determining the current status and remaining life of a power source in an implantable neurological tissue stimulator~~,~~ device comprising:

an implantable neurological tissue stimulator, the implantable neurological tissue, stimulator having:

a source of power;

a voltage determining system for determining the voltage of the source of power;

a programmer for creating and processing information to be sent to and received from the implantable neurological tissue stimulator, the programmer including a processor and a memory attached thereto;

a system for communicating information between the implantable neurological tissue stimulator and the programmer;

wherein the ~~a~~ voltage determining system for determining the voltage of the source of power passes the determined voltage of the source of power to the system for communication; and

wherein the system for communication passes the determined voltage of the source of power from the implantable neurological tissue stimulator to the programmer and to the processor, and

wherein the processor determines, based on the determined voltage of the source of power, where the source of power is in its life cycle ~~and~~; obtains a used capacity of the power source and a

time that the power source has been operating; and determines the remaining life of the power source based on the used capacity of the power source and the time that the power source has been operating. ~~takes appropriate action in response to the determination of where the source of power is in its life cycle.~~

Banner & Witcoff, Ltd.
Binal J. Patel – 312.715.1000
Serial No. 09/364,967
Attorney Docket 11738.00063
Inventors: Kelly et al.
Figure 1

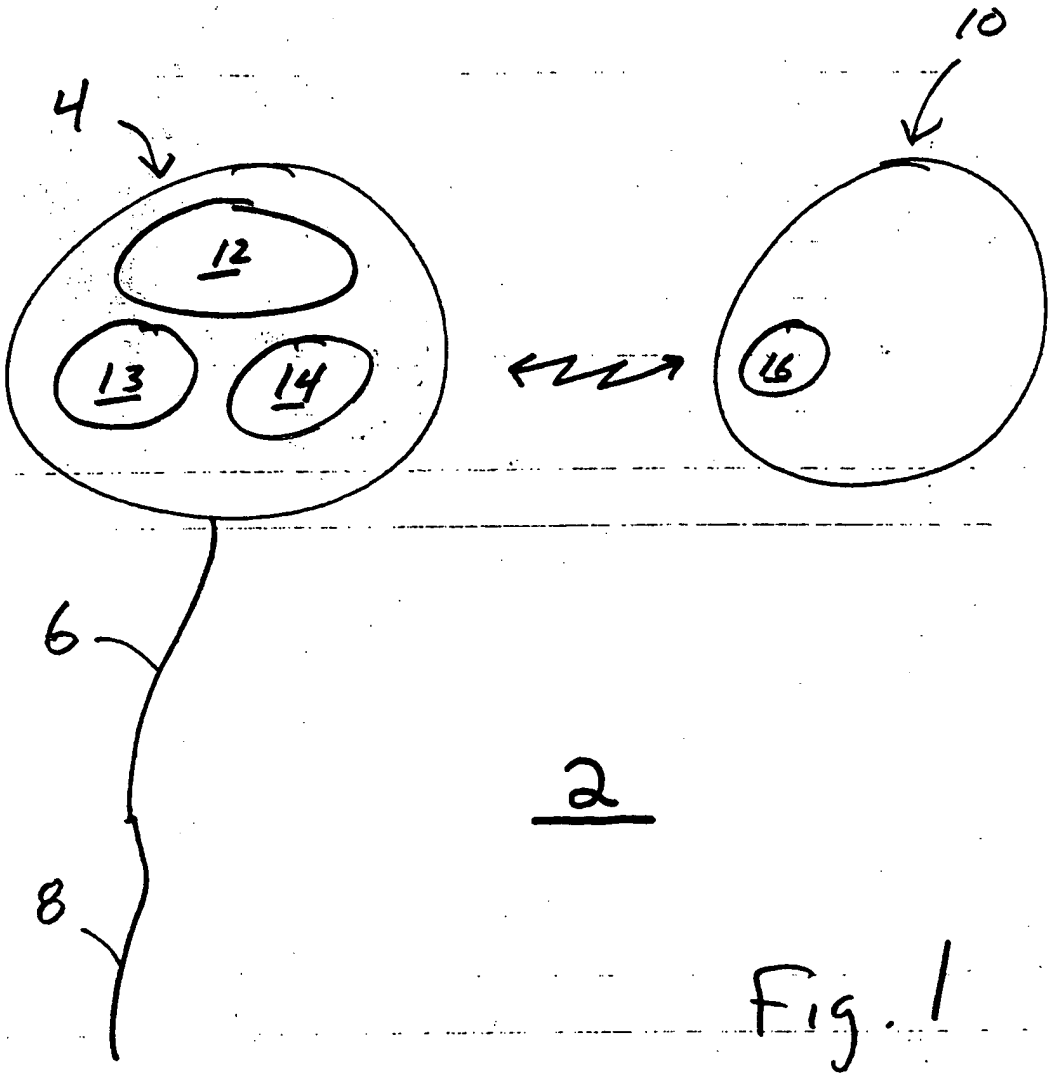


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Fig. 1

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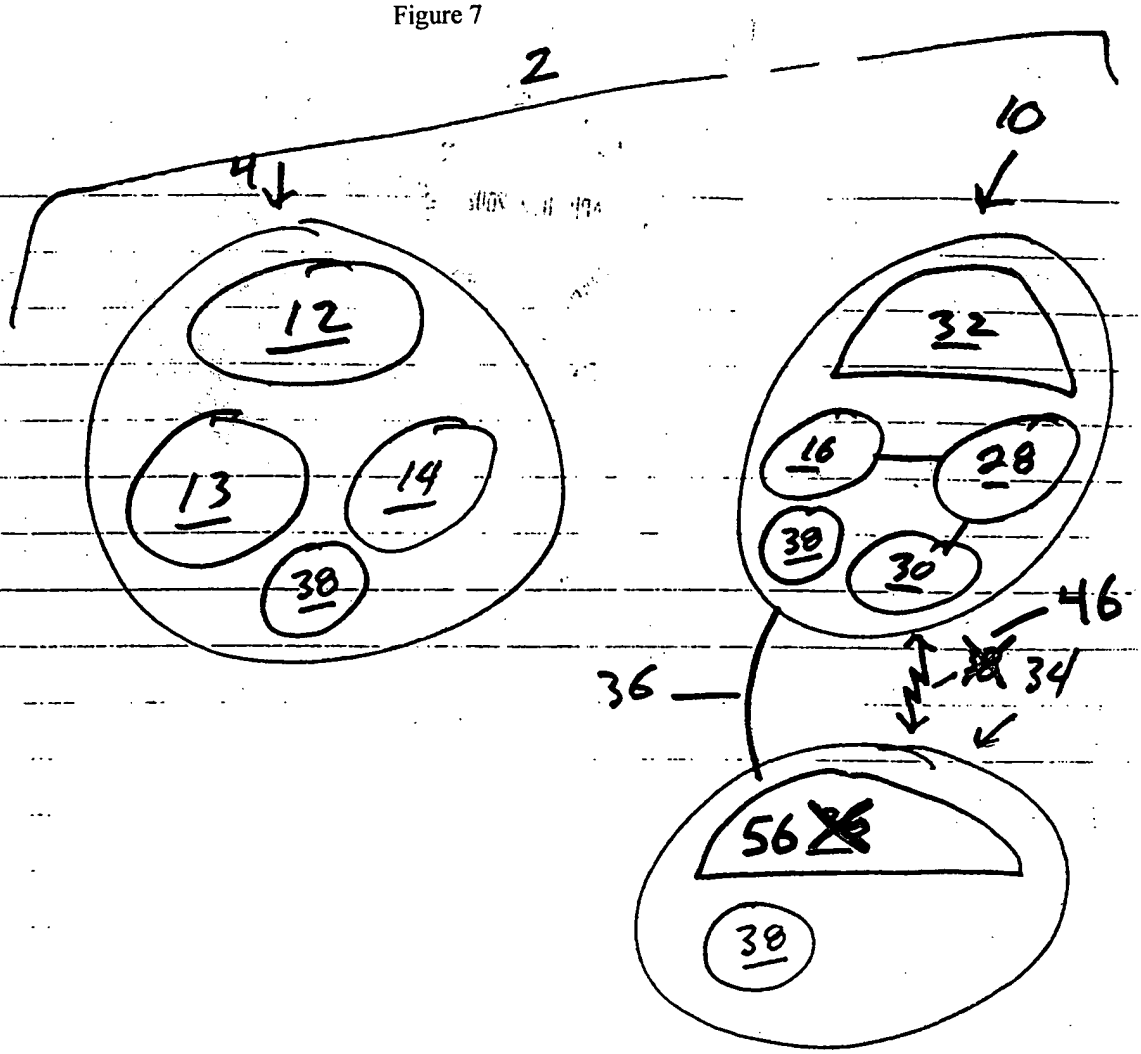


Fig 7